CLAIMS

1) A modelling method for optimizing displacement conditions, in a porous medium wettable by a first fluid, of a three-phase mixture of fluids including this first wetting fluid and at least a second, non-wetting fluid, comprising in combination :

- experimental determination of the variation curve of capillary pressure (P_c) in the pores of a sample of this porous medium in the presence of the wetting fluid and of the non-wetting fluid,

- modelling the pores of the porous medium by a distribution of capillaries with a fractal section by considering a stratified distribution of the fluids in the pores, the wetting fluid spreading out in contact with the walls and around said at least one other fluid,

- determination, from said capillary pressure curve (P_C), of the fractal dimension values corresponding to a series of given values of the saturation in the liquid phases,

- modelling hysteresis effects that modify the mobile saturations of the fluids effectively displaced in the sample according to the number of drainage and imbibition cycles undergone by the sample, involving different non-wetting fluid trapping or untrapping constants according to whether a drainage stage or an imbibition stage is carried out,

- modelling the relative permeabilities directly in the form of analytic expressions depending on the different fractal dimension values obtained, and

- entering the relative permeabilities into a porous medium simulator and determination, by means of this simulator, of optimum displacement conditions for the mixture of fluids in the porous medium.

2) A method as claimed in claim 1, characterized in that the pores of the porous medium are modelled by a distribution of capillaries with a fractal distribution by considering a stratified distribution of the fluids in the pores, the wetting fluid spreading out in contact with the walls, the gas occupying the centre of the pores and the second fluid being distributed in the form of an annular film in contact with both the gas and the first fluid.

3) A method as claimed in claim 1 or 2, characterized in that the reservoir simulator is used to determine the optimum characteristics of substances added to wetting fluid slugs injected in a formation alternately with gas slugs in order to displace hydrocarbons in place.

4) A method as claimed in any one of the previous claims, characterized in that it comprises using a reservoir simulator in order to determine the optimum characteristics of a fluid injected in the soil in order to drain polluting substances.